ENVIRONMENTAL PRODUCT DECLARATION

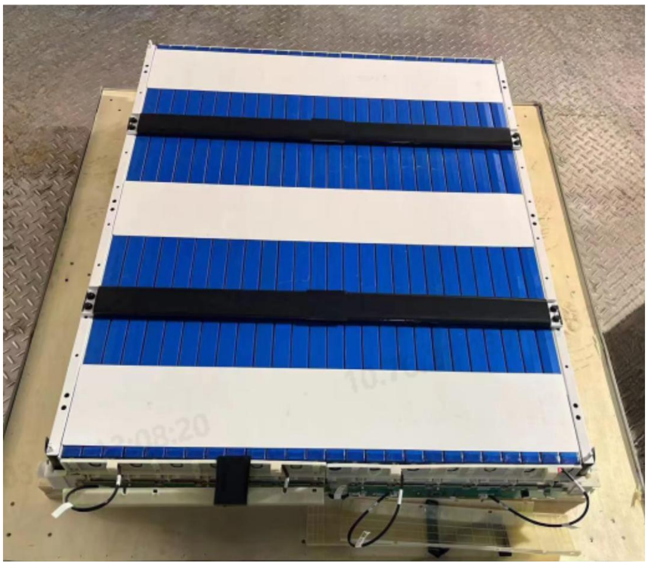
In accordance with ISO 14025 for:

Li-ion Battery module

From

BYD Auto Industry Company Limited

Declared product:



Li-ion Battery module：MC Cube 0.5C

Programme operator:	EPD China
Registration number:	EPD-CN-00018
Issued date:	2025-11-12
Valid until:	2030-11-11

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Programme Information

EPD Owner	Name: BYD Auto Industry Company Limited Contact information of EPD owner: No. 1 Lianghe Road, Lingli Town, Qingxiu District, Nanning, Guangxi xiao.qinmei@fdbatt.com 18786144460
Product Name	Li-ion Battery module：MC Cube 0.5C
Production Site	No. 1 Lianghe Road, Lingli Town, Qingxiu District, Nanning, Guangxi
Identification of product	464 “Accumulators, primary cells and primary batteries, and parts thereof”
Field of Application	The battery adopts LFP chemistry and can be assembled into different types of products, such as cabinets, containers, etc. This product is a new generation blade battery energy storage system solution, adopting a unique CTS (Cell To System) design. The first blade battery product greatly improves the energy density, safety, maintainability, flexibility, service life, and efficiency of the system. At the same time, it reduces energy consumption, costs, and footprint, providing customers with a reassuring energy storage solution with its ultimate battery strength and long lifespan.
Programme Operator	EPD China Address: 3rd floor, Lane 320, Tianping Road, Xuhui District, Shanghai Website:www.epdchina.cn Email: info@epdchina.cn | secretary@epdchina.cn
LCA Practitioner	xiao.qinmei@fdbatt.com
Responsibility	The EPD owner has the sole ownership, liability, and responsibility for the EPD
Comparability	EPDs within same category of product in different programme operator are not suggested to be compared. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible even applying the same PCR.
Validity	The EPD is published on 2025-11-12 and valid to 2030-11-11
LCA Software (version)	OpenLCA 2.2.0
LCI Dataset (version)	Ecoinvent 3.9
Year(s) of Primary Data	31/03/2024 to 28/02/2025
PCR	EPDItaly007 —PCR for Electronic and Electrical Products and Systems, Rev. 3.1 12/11/2024 EPDItaly021-Energy storage system : electronic and electrical products and systems-energy storage, Rev.5.0 03/10/2024
Other Reference Document	BS EN 50693:2019 Product category rules for life cycle assessments of electronic and electrical products and systems
Verification statement according to ISO 14025:	

Independent verification of the declaration and data according to ISO 14025:2010 ☐ internal ☑external Third-party institution verification: < Paulson Wei, DEKRA> is an approved certification body accountable for third-part verification. Approved by: EPD China
Procedure for follow-up of data during EPD validity involves a third-party verifier: ☐ Yes ☑ No

1 General Information

1.1 Company information

BYD Auto Industry is a brand under BYD Auto Industry Company Limited. BYD Group was founded in February 1995. After more than 20 years of rapid development, it has established over 30 industrial parks worldwide, achieving a strategic layout across six continents. BYD's business layout covers fields such as electronics, automobiles, new energy, and rail transit, and plays a pivotal role in these areas. From energy acquisition, storage, to application, BYD comprehensively builds zero emission new energy solutions. BYD is a listed company in Hong Kong and Shenzhen, with a turnover and total market value exceeding 100 billion yuan.
BYD adheres to independent innovation and masters the core technologies of the entire electric vehicle industry chain, including batteries, motors, electronic controls, and chips. In 2008, it launched the world's first mass-produced plug-in dual-mode electric vehicle, and in 2010, it proposed the world's first public transportation electrification solution. Since then, it has risen to a national strategy, formed a global consensus, and continues to lead industry transformation. As of the end of 2020, BYD's electric vehicle sales have been the top in China for 8 consecutive years, and it has entered more than 50 countries and regions, as well as over 300 cities worldwide. It is the first Chinese car brand to enter developed markets such as Europe, the United States, and Japan.

Table1. Location of the organization and Manufacturing sites

Company name	BYD Auto Industry Company Limited
Company address	No. 3001, 3007 HengPing Road, Pingshan, Shenzhen, P.R. China
Manufacturing site	No. 1 Lianghe Road, Lingli Town, Qingxiu District, Nanning, Guangxi

1.2 Scope and type of EPD

The system boundary considered in this LCA study is from the cradle to the grave. According to the PCR, the life cycle stage must refer to segmentation in the following 5 modules:
The Manufacturing Phase contains:
Extraction and processing of raw materials, including electrolyte, athode materials, Anode materials, Separator, Mechanical parts, etc., and the transportation of the raw material to the factory, packaging also included in this stage;
The consumption of raw materials for positive/negative electrode sheets are measured by mass balance during the actual manufacturing process of positive/negative electrode sheets, including the scraping of raw materials and/or products in the manufacturing process (not rely on the BOM).
Manufacturing of the product, including energy consumption of manufacturing process of positive/negative electrode sheets, battery pack assembly,and etc.;
Generation of process waste, including its transportation to the disposal site.

The Distribution Phase contains the road transport and maritime shipping services for product distribution to target countries.

The Installation Phase contains disposal of product packaging and transportation of packaging waste.

The Use & Maintenance Phase contains ues of electricity in use stage of product, while the product requires almost no maintenance.

The End of life Phase includes:
Transportation of the Li-ion Battery Module to the collection site; Distribution and destination of the various material flows to be sent for recycling or disposal or incineration;
Figure 1 below illustrates the system boundaries for the Li-ion Battery Modulees, including raw material production and transportation, manufacturing, distribution, installation, and End-of-life.

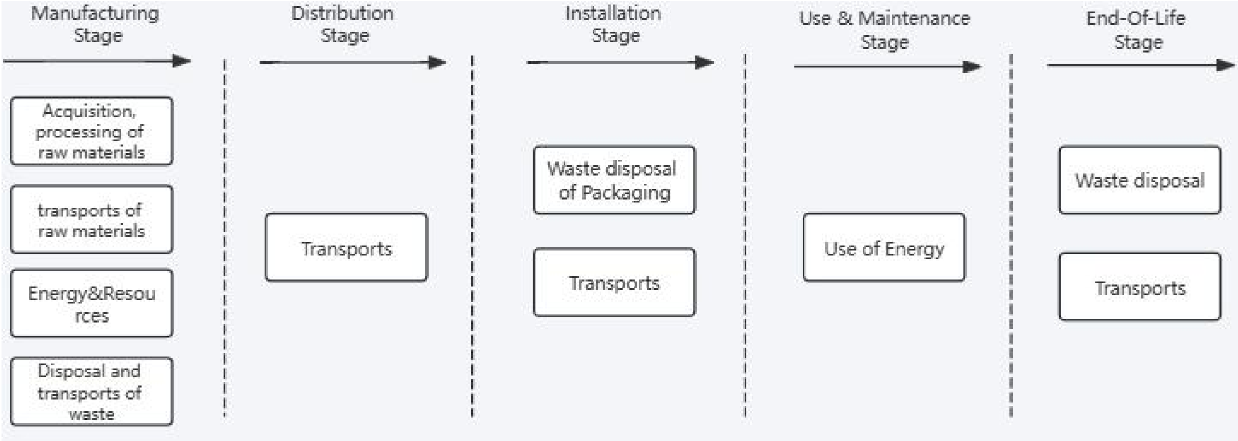

Figure 1 System boundary of target products

Detailed information on the segmentation for the five modules are presented in the following.

Table 2: Division and declarations of life cycle stages according to the PCR

Phases	Manufacturing Stage	Distribution Stage	Installation Stage	Use & Maintenance Stage	End-Of-Life Stage De-Installation	Benefits & Loads
In Accordance To EN 50693 2019						
Phases declared	X	X	X	X	X	ND
Data Quality	0.10%					

Note: X=Declared Module, ND=Module not Declared in this LCA study

2 Detailed Product Description

2.1 Description of the product

Within this EPD, Li-ion Battery module： MC Cube 0.5C is analyzed, and its battery adopts LFP chemistry and has a capacity of 29.12 kWh.

Table 3. Information of target product

Total battery capacity	29.12 kWh
Type of coupling	DC
Type of cell technology	LFP chemistry
Type of application:	Industrial
Country for installation and operating	Italy
Name, model and type of product	Li-ion Battery module： MC Cube 0.5C
Total product mass, excluding packaging of per functional unit	7.35 kg
Functional unit	kWh
Production period	31/03/2024 to 28/02/2025
Production process	Assembly, testing, etc

2.2 Description of the production processes

A flowchart depicting the production process stages of target product is shown in Figure 2 below.

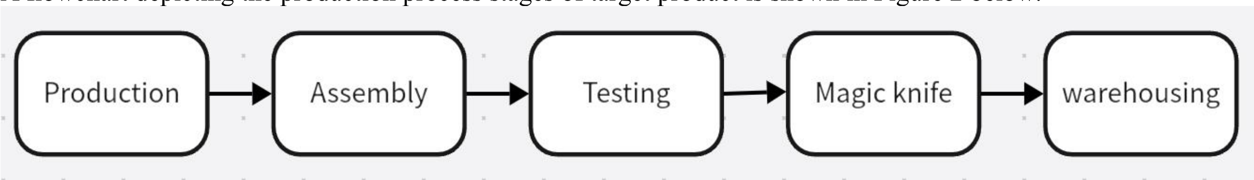

Figure 2 production processes of Li-ion Battery module of BYD

Table 4 :Li-ion Battery module： MC Cube 0.5C_Main product components and packaging materials per functional unit

Product components	**Weight, kg**	**Weight-%**
Raw materials		
Aluminium	0.5440	9.09%
copper	0.3719	6.22%
minerals	1.3078	21.86%
other ferrous matals	0.0001	0.00%
plastics	0.3354	5.61%
PCBS(metals)	0.0073	0.12%
steel	2.4690	41.28%
deionized water	0.0207	0.35%
carbon black	0.9158	15.31%
Packaging materials		
steel	0.0073	0.12%
plastics	0.0022	0.04%

Included products do not contain the substances included in the "Candidate List of SVHC" document issued by the European Chemicals Agency (http://echa.europa.eu/candidate-list-table).

2.3 Functional unit and Reference service life (RSL)

The functional unit is the product category unit to be referred to when determining environmental impacts. To assess the environmental impacts of different products, the functional units of these products must be equivalent to interpret the results.
In this study, the functional unit is specified in terms of 1 kWh. The functional unit is in 1 kWh of Battery Modules of the Stationary Energy Storage System.The design service life of this product can reach 20 years, so the environmental impact indicators for 10 years and 20 years have been calculated separately.

3 LCA results according to the PCR

The results of the underlying LCA are provided in this section as environmental impacts, resource use, output flows.

3.1 Environmental impact descriptive parameters

Table 5-1 :Li-ion Battery module：MC Cube 0.5C_ Environmental impacts（RSL=10）

RESULTS OF THE LCA –Environmental impacts per functional unit for Li-ion Battery module：MC Cube 0.5C							
Core indicator	**Unit**	**Total**	**Manufacturing Stage**	**Distribution Stage**	**Installation Stage**	**Use & Maintenance Stage**	**End-Of-Life Stage De-Installation**
Climate change-total(GWP-total)	kg CO_2 eq	2.15E+02	6.20E+01	2.34E+00	7.78E-03	1.49E+02	1.85E+00
Climate change - Biogenic (GWP-biogenic)	kg CO_2 eq	1.53E-03	1.07E-03	3.44E-04	1.09E-04	0.00E+00	0.00E+00
Climate change - Fossil(GWP-fossil)	kg CO_2 eq	2.12E+02	6.20E+01	2.34E+00	7.67E-03	1.47E+02	9.18E-01
Climate change - Land use and change in land use(GWP-luluc)	kg CO_2 eq	1.20E-01	9.70E-02	1.49E-03	2.26E-07	2.12E-02	1.40E-04
Acidification(AP)	mol H+ eq	2.10E+00	1.58E+00	4.05E-02	2.72E-06	4.79E-01	1.01E-03
Eutrophication of acquatic freshwater(EP-freshwater)	kg P eq	6.74E-02	4.12E-02	1.30E-04	1.97E-07	2.61E-02	3.63E-05
Eutrophication acquatic marine(EP-marine)	kg N eq	2.23E-01	1.27E-01	1.07E-02	1.55E-06	8.53E-02	4.40E-04
Eutrophication terrestrial(EP-terrestrial)	mol N eq	5.54E+00	4.49E+00	1.17E-01	1.30E-05	9.22E-01	4.29E-03
Ozone depletion(ODP)	kg CFC11 eq	7.55E-06	4.09E-06	3.56E-08	6.98E-12	3.42E-06	3.63E-09
Photochemical ozone formation(POCP)	kg NMVOC eq	7.21E-01	2.85E-01	3.32E-02	3.59E-06	4.01E-01	1.36E-03
Depletion of abiotic resources - fossil resources(ADP-fossil)	MJ	2.88E+03	7.11E+02	3.03E+01	4.00E-03	2.14E+03	2.59E+00
Depletion of abiotic resources - minerals and materials(ADP-minerals&metals)	kg Sb eq	5.77E-03	4.76E-03	4.53E-06	7.56E-10	1.01E-03	5.01E-07
Water consumption(WDP)	m^3 depriv.	7.24E+01	2.27E+01	1.23E-01	9.96E-05	4.95E+01	3.97E-03

Table 5-2 :Li-ion Battery module：MC Cube 0.5C_ Environmental impacts（RSL=20）

RESULTS OF THE LCA –Environmental impacts per functional unit for Li-ion Battery module：MC Cube 0.5C							
Core indicator	**Unit**	**Total**	**Manufacturing Stage**	**Distribution Stage**	**Installation Stage**	**Use & Maintenance Stage**	**End-Of-Life Stage De-Installation**
Climate change-total(GWP-total)	kg CO_2 eq	3.64E+02	6.20E+01	2.34E+00	7.78E-03	2.98E+02	1.85E+00
Climate change - Biogenic (GWP-biogenic)	kg CO_2 eq	1.53E-03	1.07E-03	3.44E-04	1.09E-04	0.00E+00	0.00E+00
Climate change - Fossil(GWP-fossil)	kg CO_2 eq	3.59E+02	6.20E+01	2.34E+00	7.67E-03	2.94E+02	9.18E-01
Climate change - Land use and change in land use(GWP-luluc)	kg CO_2 eq	1.41E-01	9.70E-02	1.49E-03	2.26E-07	4.24E-02	1.40E-04
Acidification(AP)	mol H+ eq	2.58E+00	1.58E+00	4.05E-02	2.72E-06	9.58E-01	1.01E-03
Eutrophication of acquatic freshwater(EP-freshwater)	kg P eq	9.36E-02	4.12E-02	1.30E-04	1.97E-07	5.22E-02	3.63E-05
Eutrophication acquatic marine(EP-marine)	kg N eq	3.09E-01	1.27E-01	1.07E-02	1.55E-06	1.71E-01	4.40E-04
Eutrophication terrestrial(EP-terrestrial)	mol N eq	6.46E+00	4.49E+00	1.17E-01	1.30E-05	1.84E+00	4.29E-03
Ozone depletion(ODP)	kg CFC11 eq	1.10E-05	4.09E-06	3.56E-08	6.98E-12	6.84E-06	3.63E-09
Photochemical ozone formation(POCP)	kg NMVOC eq	1.12E+00	2.85E-01	3.32E-02	3.59E-06	8.03E-01	1.36E-03
Depletion of abiotic resources - fossil resources(ADP-fossil)	MJ	5.02E+03	7.11E+02	3.03E+01	4.00E-03	4.27E+03	2.59E+00
Depletion of abiotic resources - minerals and materials(ADP-minerals&metals)	kg Sb eq	6.78E-03	4.76E-03	4.53E-06	7.56E-10	2.01E-03	5.01E-07
Water consumption(WDP)	m^3 depriv.	1.22E+02	2.27E+01	1.23E-01	9.96E-05	9.90E+01	3.97E-03

3.2 Parameters describing resource use

Table 6-1:Li-ion Battery module：MC Cube 0.5C_ Resource use（RSL=10）

RESULTS OF THE LCA –Resource use per functional unit for Li-ion Battery module：MC Cube 0.5C							
Core indicator	**Unit**	**Total**	**Manufacturing Stage**	**Distribution Stage**	**Installation Stage**	**Use & Maintenance Stage**	**End-Of-Life Stage De-Installation**
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material（PENRE）	MJ	2.83E+03	6.63E+02	3.03E+01	4.00E-03	2.14E+03	2.59E+00
Use of renewable primary energy excluding renewable primary energy resources used as raw material（PERE）	MJ	1.73E+02	1.70E+01	3.10E-01	7.95E-05	1.56E+02	4.11E-02
Use of non-renewable primary energy resources used as raw material（PENRM）	MJ	4.80E+01	4.80E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable primary energy resources used as raw material (PERM）	MJ	2.96E-01	2.96E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT）	MJ	2.88E+03	7.11E+02	3.03E+01	4.00E-03	2.14E+03	2.59E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)（PERT）	MJ	2.31E+02	7.45E+01	3.10E-01	7.95E-05	1.56E+02	4.11E-02
Net use of fresh water (FW)	m^3	2.48E-02	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of secondary raw materials (SM)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Table 6-2:Li-ion Battery module：MC Cube 0.5C_ Resource use（RSL=20）

RESULTS OF THE LCA –Resource use and waste categories per functional unit for Li-ion Battery module：MC Cube 0.5C							
Core indicator	**Unit**	**Total**	**Manufacturing Stage**	**Distribution Stage**	**Installation Stage**	**Use & Maintenance Stage**	**End-Of-Life Stage De-Installation**
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material（PENRE）	MJ	4.54E+03	6.63E+02	3.03E+01	4.00E-03	4.27E+03	2.59E+00
Use of renewable primary energy excluding renewable primary energy resources used as raw material（PERE）	MJ	8.58E+02	1.70E+01	3.10E-01	7.95E-05	3.12E+02	4.11E-02
Use of non-renewable primary energy resources used as raw material（PENRM）	MJ	4.80E+01	4.80E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable primary energy resources used as raw material (PERM）	MJ	2.96E-01	2.96E-01	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (PENRT）	MJ	4.59E+03	7.11E+02	3.03E+01	4.00E-03	4.27E+03	2.59E+00
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)（PERT）	MJ	9.15E+02	7.45E+01	3.10E-01	7.95E-05	3.12E+02	4.11E-02
Net use of fresh water (FW)	m³	2.48E-02	2.48E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of secondary raw materials (SM)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of non-renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

3.3 Waste production descriptive parameters

Table 7: Li-ion Battery module：MC Cube 0.5C_ waste categories（RSL=10&20）

RESULTS OF THE LCA – Waste categories per functional unit for Li-ion Battery module：MC Cube 0.5C							
Core indicator	**Unit**	**Total**	**Manufacturing Stage**	**Distribution Stage**	**Installation Stage**	**Use & Maintenance Stage**	**End-Of-Life Stage De-Installation**
Hazardous landfill waste (HWD)	kg	2.28E-02	1.93E-02	0.00E+00	0.00E+00	0.00E+00	3.43E-03
Non-hazardous waste disposed (NHWD)	kg	3.41E+00	0.00E+00	0.00E+00	4.51E-03	0.00E+00	3.40E+00
Radioactive waste disposed (RWD)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery (MER)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported thermal energy (ETE)	MJ, net calorific value	7.26E-01	0.00E+00	0.00E+00	1.29E-02	0.00E+00	7.13E-01
Exported electricity energy (EEE)	MJ, net calorific value	2.90E-01	0.00E+00	0.00E+00	5.15E-03	0.00E+00	2.85E-01
Material for recycling (MFR)	kg	3.96E+00	0.00E+00	0.00E+00	5.96E-03	0.00E+00	3.95E+00
Components for reuse (CRU)	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

4 Supplementary information

4.1 Calculation rules

4.1.1 functional unit

In this EPD, the functional unit is defined as 1 kWh. Specifically, it refers to 1 kWh of Battery Modules from the Stationary Energy Storage System. The functional unit is one piece of Battery Modules from the Stationary Energy Storage System, characterized by a rated service life (RSL) of 20 years and a consistent efficiency of 93.92%.

4.1.2 Assumptions

1. At the end-of-life (EOL) stage, products are disposed of locally, includes the transportation and operations for recycling & the waste disposal of the product at the end of its service life, the recycling rates and waste disposal and for each material are in accordance with the specific data from EN 50693:2019.
2. The target product does not involve battery electrical auxiliary equipment. So, Puse=0.
3. In this project, we assume that the battery capacity has not decayed within 20 years of RSL. According to related product energy efficiency testing report, it is a consistent efficiency of 93.92%.
4. Regarding transportation for unspecified distances, such as at the end-of-life stage, the assumption is that transport will cover 50 kilometers within Europe, based on information provided by the disposal provider.

4.1.3 Cut off rules

1. Some general solid waste generated during the manufacturing stage is excluded from the calculation as it is recycled during the disposal stage. Incineration models are utilized for solid waste that cannot be recycled; however, the environmental impact of its transportation to the recycling facility is included in the assessment.
2. The product virtually requires no maintenance, and the environmental emissions from maintenance are excluded.
3. The environmental impact of personnel, infrastructure, and production equipment that are not directly consumed throughout the entire process is not included within the system boundary.

4.1.4 Data quality

In this study, primary and secondary data were used. BYD provided on-site specific prospect data. The main data source is the relevant data list managed on the internal system of the enterprise. The on-site data adheres to the following principles:

- The consumption of raw materials for positive/negative electrode sheets are measured by mass balance during the actual manufacturing process of positive/negative electrode sheets, including the scraping of raw materials and/or products in the manufacturing process (not rely on the BOM).
- Time-related coverage: The data utilized comprises the most recent field data from 31/03/2024 to 28/02/2025. The datasets employed for calculations are derived from 1-year averaged data, which have been updated within the last five years for producer-specific data.
- Geographical coverage: All field data used is local to the production site.
- Technology coverage: The field data represents the most pertinent technical data.

For all processes without original data, generic data from the ecoinvent v3.9 database is used and allocated by category. The ecoinvent database is provided in the OpenLCA 2.2.0 software used for calculation. The ecoinvent v3.9 cut-off classification system process is used to model the background system of the process. It is assumed that these datasets are representative, as described below:

- Time-related coverage: Generic data from the ecoinvent v3.9 database, which is the database from the year 2023, has been updated within the past decade..
- Geographical coverage: The raw materials input for the model is based on ecoinvent data with a coverage of the global market (GLO) or the rest of the world (ROW). The background data for electricity and other energy sources used in the manufacturing stage is based on local grid emission factors. The electricity coefficient for the usage stage is detailed in Section 4.3.
- Technology coverage: Most of the background data corresponds to technologies that are exactly the same as those actually used, or the technology corresponding to the background data is partially included in the combination of technologies actually used.

4.1.5 Allocation of input and output flows

The energy sources involved in the manufacturing process of positive/negative electrode sheets, as well as the battery pack assembly production stage are electricity, natural gas, water, heat transfer oil and helium used for product manufacturing or testing, . The energy consumption of the production section is apportioned based on the total production capacity of the products in the involved workshops and the capacity of the products themselves. Details are as follows:

$$E=\frac{Total\ consumption\ (electricity\ ,\text{natural gas , water, thermal oil or helium) of relative stage}}{Total\ kW\text{h}\ (Production\ of\ all\ products)} \quad (1)$$

4.1.6 Allocation by reuse, recycling and recovery process

The waste treatment process after the final product is scrapped (all modeled as incineration) has been included in the study. Regarding the recycling process of waste outside the product system boundary, only the environmental impact of the part where the waste is transported to the treatment unit is considered.

4.2 Scenarios and additional technical information

4.2.1 Acquisition and transportation of raw materials

This stage mainly includes the acquisition, processing, and transportation of raw materials. We calculated the consumption of raw materials and processes for producing electrolytes, positive electrode materials, negative electrode materials, separators, mechanical parts, etc. through the method of mass balance during the production process.

In terms of raw material transportation, we obtain transportation activity data by multiplying the distance by the weight of the material. In addition, all raw materials are sourced from domestic suppliers and modeled using unspecified trucks.

4.2.2 Manufacturing

The energy involved at this stage of the product includes electricity, natural gas, and water. The allocation method is detailed in Chapter 4.1. The data specifics are presented in Table 8 (covering the period from 31/03/2024 to 28/02/2025).

Table 8: Allocation results for target product

Item	Amount	Unit
Electricity consumption	10.3369	kWh
Natural gas consumption	0.7256	m^3
Water consumption	0.0248	t
thermal oil consumption	0.00003951	kg
helium consumption	0.0001187	kg

Note: The source of natural gas calorific value is GB/T 2589-2020, with a value of 38.9 MJ/m³.

4.2.3 Product distribution

The products are assumed to be transported to Italy in Europe for application.

Table 9: the information of distribution for target product

Product	Startpoint	Terminal	Modeof transportation	Land-Transport distance (km)	Maritime-Transport distance(km)	Product Mass (kg)	Corresponding packaging (kg)
Li-ion Battery module: MC Cube 0.5C	Qingxiu District, Nanning City, Guangxi	Italy	Ship+Freight car	1000	16056.84	7.35	0.0104

4.2.4 Installation

At this stage, the packaging materials are discarded. The quality and disposal rate during the packaging waste stage are shown in the table below:

Table 10: Li-ion Battery module：MC Cube 0.5C_Waste treatment scenario for packaging

Material-Packaging	Waste weight(kg)	Disposal rate	Disposal weight(kg)
Other Plastic	0.0080	50%	0.0040
Steel	0.0024	20%	0.0005

4.2.5 Uses and maintenance

As for use phase:

The target product does not involve battery electrical auxiliary equipment. So, Puse=0.

$E_{usefull}$ is nominal energy, which is 29.12 kWh. Ncycles is 1. DC RTEi adopts 93.92% of the third-party certification testing report. In addition, battery capacity loss is not considered.

As for the electricity consumption, We calculated the electricity consumption for RSL=10&20 respectively respectively according to the calculation formular in PCR, as follows:
RSL=10 : we can calculation the Etot of each product, which is 6886.68. Each unit kWh of the product is 236.49.
However, RSL=20 : we can calculation the Etot of each product, which is 13773.36. Each unit kWh of the product is 472.99.
During the use and maintenance phase, the failure rate of the power module is almost zero, so it is not considered.

4.2.6 EOL stage

During the end-of-life stage, the transportation of waste materials adheres to the model distance of 50 km provided by the disposal provider. Factors related to disassembly are utilized in the calculation of the waste processing stage. The materials' disposal rate and recycling rate for each material are based on specific data from EN 50693:2019. Below is the table summarizing the disposal material amounts for the target product during end-of-life:

Table 11 :Li-ion Battery module：MC Cube 0.5C_Waste treatment scenario

Material-BOM	Waste weight(kg)	Disposal rate	Disposal weight(kg)
Aluminium	0.7477	30%	0.2243
copper	0.4925	40%	0.1970
minerals	1.5568	100%	1.5568
other ferrous matals	0.0001	20%	2.80E-05
other plastics	0.4800	50%	0.2400
PCBS(metals)	0.0054	50%	0.0027
steel	2.7953	20%	0.5591
water	0.0244	0%	0.00E+00
carbon black	1.2557	50%	0.6279

4.3 Other clarification matters

This study highlights the use of various power grid combinations at different stages of the life cycle. Specifically, the product is manufactured in Guangxi, China, utilizing the power structure of the China Southern Power Grid for modeling purposes. During the usage and maintenance phases, the average power structure of the European market is used. For further details, please refer to Table 12.

Table 12: Electricity factor situation

Consumption type	Electricity process type	Value	Sources
Electricity use in upstream module and manufacturing stage-grid power	market for electricity, low voltage-CN-CSG-electricity, low voltage	0.65 kg CO_2-eq/kWh	Ecoinvent data set Version 3.9
Electricity use in the downstream module	electricity, low voltage, residual mix - IT- electricity, low voltage	0.605 kg CO_2-eq/kWh	

On the requirements of EPDItaly0021— Energy storage system : electronic and electrical products and systems-energy storage, Rev. 5.0, all electricity generation shall be calculated using the residual mix. However, the Chinese regional grid factors do not include a "residual mix" category.

Therefore, we conducted a sensitivity analysis: According to the grid structure of Guangxi Province, we selected the GWP factors for electricity production-hard coal and electricity production-nuclear in Guangdong Province to simulate and construct a residual mix for sensitivity analysis.

The GWP value of simulated emission is 0.65 kg CO2-eq/kWh, with a 4.43% deviation of selected electricity emission factor. Since the environmental impact of electricity consumption during the manufacturing stage is extremely minor — taking the GWP-Total indicator as an example, where electricity emissions during the manufacturing stage account for less than 3% of the total indicator value—the overall impact of using this factor is negligible, contributing less than 0.1% to the total GWP across all life stages.

So, the use of the data "Electricity, low voltage {CN-CSG}| market group for | Cut-off, U" has an insignificant effect on the final EPD results. Finally, we have retained this factor.

5 References

[1] EPD China General Programme Instructions V 3.0
[2] EN 50693:2019, Product category rules for life cycle assessments of electronic and electrical products and systems.
[3] Ecoinvent, 2023. Swiss Centre for Life Cycle Assessment, v3.9(www.ecoinvent.ch).
[4] ISO 14025:2006, Environmental labels and declarations-Type III environmental declarations-Principles and procedures.
[5] ISO 14040: 2006/Amd 1:2020 Environmental management - Life cycle assessment - Principles and framework Amendment 1 (ISO 2020).
[6] ISO 14044: 2006/Amd 2:2020 Environmental management - Life cycle assessment - Requirements and guidelines Amendment 2 (ISO 2020).
[7] EPDItaly007-PCR for Electronic and Electrical Products and Systems, Rev. 3.1 12/11/2024
[8] EPDItaly021-Energy storage system : electronic and electrical products and systems-energy storage, Rev. 5.0 03/10/2024

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